WHAT IS CLAIMED IS:

1. A feed forward amplifier, comprising:

an input for receiving an RF signal;

a main amplifier receiving and amplifying said RF signal;

a gain adjuster coupled between the RF input and the main amplifier;

a main amplifier output sampling coupler;

a first delay coupled to the input and providing a delayed RF signal;

a carrier cancellation combiner coupling the delayed RF signal to the sampled output from the main amplifier;

a test coupler for sampling the output of the carrier cancellation combiner;

an error amplifier receiving and amplifying the output of the carrier cancellation combiner;

a second delay coupled to the output of the main amplifier;

an error coupler combining the output from the error amplifier and the delayed main amplifier output from the second delay so as to cancel distortion introduced by the main amplifier;

an output coupled to the error coupler output and providing an amplified RF signal; and

an adaptive controller, coupled to the test coupler, for controlling the gain adjuster setting to provide a gain adjustment which is offset from a gain adjustment which maximizes carrier cancellation at the carrier cancellation combiner, which offset is adjustable by changing the floor of a gain adjustment cost function.

2. A feed forward amplifier as set out in claim 1, further comprising an input reference coupler for sampling the RF signal provided to the input and wherein the adaptive controller is coupled to the input reference coupler and derives a first loop gain value from the signals from the test coupler and input reference coupler.

3. A feed forward amplifier as set out in claim 2, further comprising a first signal power detector and a first analog to digital converter coupled between the input reference coupler and the controller and a second signal power detector and a second analog to digital converter coupled between the test coupler and the controller.

4. A feed forward amplifier as set out in claim 1, further comprising a phase adjuster coupled between the input and the main amplifier.

5. A feed forward amplifier as set out in claim 4, wherein the controller controls the phase adjuster to provide a phase adjustment which maximizes carrier cancellation at the carrier cancellation combiner.

6. A feed forward amplifier as set out in claim 1, wherein said adaptive controller comprises a processor implementing a cost minimization search algorithm.

7. A feed forward amplifier as set out in claim 6, wherein said cost minimization search algorithm includes a penalty based on the direction of gain adjustment.

8. A feed forward amplifier as set out in claim 1, further comprising a source of a pilot signal which is injected into the signal path before said main amplifier and a pilot signal detector coupled to the output and wherein the controller receives the detected pilot signal.

9. A feed forward amplifier as set out in claim 8, further comprising a second gain adjuster and a second phase adjuster coupled between the carrier cancellation combiner and the error amplifier and wherein the controller adjusts the setting of the second gain adjuster and second phase adjuster based on the detected pilot signal.

10. A feed forward amplifier, comprising:

an input for receiving an RF input signal;

a first control loop coupled to the input and comprising a main amplifier, a sampling coupler, a delay, and a cancellation combiner, the first control loop having a gain;

a second control loop coupled to the first control loop and comprising a delay, an error amplifier, and an error coupler;

an output coupled to the error coupler;

means for detecting the first control loop gain; and

means, coupled to the means for detecting, for controlling the first control loop gain to stabilize said control loop gain at a value offset from a minimum of a loop gain control function.

11. A feed forward amplifier as set out in claim 10, wherein said means for controlling comprises a gain adjuster in said first control loop between the input and main amplifier and a processor implementing a loop control algorithm and providing variable adjuster settings to said gain adjuster.

12. A feed forward amplifier as set out in claim 11, wherein said means for detecting comprises an input reference coupler coupled to the input and a test coupler coupled to the output of the carrier cancellation combiner.

13. A feed forward amplifier as set out in claim 12, wherein said means for detecting further comprises a first signal power detector coupled to said input reference coupler and a second signal power detector coupled to said test coupler.

14. A feed forward amplifier as set out in claim 13, wherein said means for detecting further comprises a first analog to digital converter coupled to said first signal power detector and outputting a first digital power signal to said processor

and a second digital to analog converter coupled to said second signal power detector and outputting a second digital power signal to said processor.

15. A feed forward amplifier as set out in claim 14, wherein said processor determines said first control loop gain from the first and second digital power signals.

16. A feed forward amplifier as set out in claim 10, wherein said processor and algorithm calculate a cost function associated with the adjuster settings which is derived from the detected first control loop gain and a preset floor value of the cost function.

17. A feed forward amplifier as set out in claim 16, wherein said processor and algorithm vary said adjuster settings employing said cost function to move the calculated cost function toward the preset floor value.

18. A feed forward amplifier as set out in claim 17, wherein said processor and algorithm further add a penalty to the cost function if the cost function is at the floor value and the adjuster setting is moving in an undesired direction.

19. A feed forward amplifier as set out in claim 18, wherein the undesired direction corresponds to increasing gain adjuster settings.

20. A feed forward amplifier as set out in claim 18, wherein the undesired direction corresponds to decreasing gain adjuster settings.

21. A method for amplifying an RF input signal employing feed forward compensation, comprising:

receiving an RF input signal;

amplifying said RF input signal employing a main amplifier;

sampling the main amplifier output;

delaying the RF input signal and providing a delayed RF input signal;

coupling the delayed RF input signal to the sampled output from the main amplifier so as to cancel at least a portion of a carrier component of said sampled output from the main amplifier and provide a carrier canceled signal having a carrier component and a distortion component;

amplifying the carrier canceled signal employing an error amplifier to provide an error signal;

delaying the output of the main amplifier;

combining the error signal and the delayed output of the main amplifier so as to cancel distortion introduced by the main amplifier and providing an amplified RF output;

adjusting the gain of the signal input to said main amplifier by a variable gain setting; and

controlling said adjusting of the gain of the signal to a steady state setting offset from a setting which minimizes the carrier component of said carrier canceled signal by employing a gain control cost function having a floor and a penalty associated with the direction of said adjusting.

22. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 21, wherein said penalty is associated with increasing the gain of the signal and said steady state setting is offset below a setting which minimizes the carrier component of said carrier canceled signal.

23. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 21, wherein said penalty is associated with decreasing the gain of the signal and said steady state setting is offset above a setting which minimizes the carrier component of said carrier canceled signal.

24. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 21, wherein the floor of said cost function defines a plurality of gain settings having equal cost.

25. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 24, wherein said steady state setting comprises one of said plurality of gain settings having equal cost.

26. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 25, wherein said steady state setting comprises the lowest gain setting having equal cost.

27. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 25, wherein said steady state setting comprises the highest gain setting having equal cost.

28. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 21, wherein said gain control cost function has a lower boundary defined by said floor, said lower boundary having first and second edges.

29. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 28, wherein said steady state setting corresponds to one of said first and second edges of said lower boundary of the cost function.

30. An adaptive controller for controlling a loop of an amplifier system, comprising:

a first input for receiving a loop input power level;

a second input for receiving a loop output power level; and

a processor coupled to the first and second inputs and programmed with a loop control algorithm to provide as an output adjuster settings based on the loop input power level and the loop output power level, the loop control algorithm comprising a cost function having a floor value and a penalty associated with the direction of adjustment of the settings.

31. A method for controlling an amplifier system having a control loop comprising a control loop input, a main signal path including an amplifier, and a control loop output, said method comprising:

determining a loop gain from signal levels at the control loop input and control loop output;

comparing the loop gain to a floor value;

if the loop gain is greater than said floor value setting a loop control cost function equal to the loop gain;

if the loop gain is less than said floor value, setting the loop control cost function equal to the floor value;

determining the adjustment direction of the loop control;

if the loop control is adjusting in an undesired direction adding a penalty to the floor value to derive a new cost function; and

adjusting the gain of the main signal path so as to minimize the value of the cost function.

32. A method of adjusting the steady state control setting of a control loop of an amplifier system, comprising:

setting an initial floor value of a loop control cost function to a first value near a minimum possible value of the cost function;

adding a penalty to the loop control cost function based on the direction of adjustment of the control setting;

controlling the loop to minimize the loop control cost function incorporating the floor and penalty;

increasing the floor value of the loop control cost function while monitoring the performance of the amplifier system; and

setting a final floor value of the loop control cost function near a value where increasing the floor value further causes degradation of amplifier performance.

33. A method of controlling a control loop of an amplifier system, comprising:

detecting a controllable signal characteristic of the control loop of the amplifier system, the signal characteristic having a minimum attainable value;

adjusting the value of a control parameter of the control loop to adjust the controllable signal characteristic to a desired value above the minimum attainable value, said desired value of the controllable signal characteristic corresponding to a plurality of different control parameter values; and

further adjusting the value of said control parameter to a steady state value comprising one of said plurality of control parameter values.